



UNIVERSITY OF  
MINES AND TECHNOLOGY (UMaT),  
TARKWA

# PROFESSORIAL INAUGURAL LECTURE

**Prof Grace Ofori-Sarpong**

PhD (Penn State), Msc, BSc (KNUST)  
FGA, FWA IMM, MSME, MIAE, MSPE, MLiMAP-Gh, MWIM-Gh

**Topic:**

**Mycohydrometallurgy: 'One-Pot' Degradation of Double  
Refractory Gold Ores by *Phanerochaete chrysosporium***



**DATE**

Thursday,  
13th October, 2022

**VENUE**

UMaT  
Auditorium

**TIME**

2:30 pm



<http://youtube.be/YdNrehF4EwU>



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Chairman

**Prof Richard Kwasi Amankwah**

Vice Chancellor - UMaT

Thursday, 13th October, 2022  
UMaT Auditorium  
2:30pm

## **PROGRAMME OUTLINE**

**2:30pm** Arrival of Guests

**2:45pm** Vice Chancellor's Procession

University Anthem

**3:00pm** Opening Prayer

- University Chaplain

**3:05pm** Introduction of Lecturer

- Vice Chancellor

**3:15pm** Inaugural Lecture

- Prof Grace Ofori-Sarpong

University Song

Closing Prayer

- University Chaplain

Recession



## **Prof Grace Ofori-Sarpong**

PhD (Penn State), Msc, BSc (KNUST)  
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## **THE PROFESSORIAL JOURNEY OF GRACE OFORI-SARPONG**

### **Profile of Professor Grace Ofori-Sarpong**

Prof Grace Ofori-Sarpong is the first female Professor of Minerals Engineering in Ghana, and currently the Dean of School of Postgraduate Studies at the University of Mines and Technology (UMaT), Tarkwa, Ghana. She holds a PhD in Energy and Mineral Engineering from the Pennsylvania State University, University Park, USA, MSc in Environmental Resources Management and BSc in Metallurgical Engineering, both from the Kwame Nkrumah University of Science and Technology, KNUST, Kumasi, Ghana. Her previous positions held in UMaT include Acting Pro Vice Chancellor, Dean of Faculty of Mineral Resources Technology, Vice Dean of Planning and Quality Assurance Unit, Head of Petroleum Engineering Department, Head of Environmental and Safety Engineering Department, Coordinator of University Examinations, and Officer of Faculty and Department Examinations.

Grace serves as a member on several national boards including the Governing Boards of the Minerals Income Investment Fund, Ghana Chamber of Mines Tertiary Education Fund, and the Governing Council of University of Mines and Technology. In addition, she serves/has served on the Governing Board of Academic City College, and numerous national and international committees including the Ministerial Committee of Enquiry on Health and Safety in the Mining Industry, the Publication Committee of Ghana Academy of Arts and Sciences, the Committee of Independent Reviewers for International PhD Scholarship, and as Associate Editor of the Journal of Sustainable Metallurgy. She has also served as organiser, keynote speaker, resource person and moderator for several conferences, workshops and seminars both locally and internationally.

Grace is actively involved in research and consultancy in the areas of precious minerals beneficiation, aqueous processing, mine waste treatment, acid mine drainage issues, and myco-hydrometallurgy, among others, and she has about 90 technical publications to her credit. With 20 years' experience in lecturing and research in minerals-related issues and community service, Grace has made a lot of strides including receiving an international award

in 2017 from OWSD-Elsevier Foundation for her contribution to science and her positive role in inspiring and mentoring females to reduce the gender gap in STEM. Grace is the Founder and President of Ladies in Mining and Allied Professions in Ghana (LiMAP-Gh), a Fellow of the Ghana Academy of Arts and Sciences (GAAS), and West African Institute of Mining, Metallurgy and Petroleum (WAIMM). She is also a member of the Society for Mining, Metallurgy and Exploration Engineers (SME), International Association of Engineers, Society of Petroleum Engineers (SPE) and Women in Mining, Ghana.

### **The Academic Story of Prof Grace Ofori-Sarpong**

Prof Grace Ofori-Sarpong has blazed the trail of being the first in her family history to attain the highest academic degree (PhD) and the highest academic rank (Full University Professor). Born into a large and humble extended family with many people ending their education at pre-university level, it was difficult to convince anybody that a woman could live above the huge obstacles including the societal definition of who a woman should be, traditional requirements of what a woman should do, and family demands on what a woman should have; and reach out to unlimited heights. With a strong passion to change the story one day for her family and reach out as a role model to the less-privileged girl to make the sky her springboard to higher heights, Grace attached all seriousness to her education.

### **The Secondary School Education**

Passing her Common Entrance examination with excellence, she was automatically awarded the Ghana Government Scholarship and the Cocoa Marketing Board Scholarship for her Secondary School Education from 1985/1986 to 1989/1990 academic years at Yaa Asantewaa Girls Secondary School (YAGSS) in Tanoso, Kumasi. In 1988 and 1989, she had the chance to represent her school in the Second and Third Science, Technology, Mathematics Education (STME) in Ghana, where she won a Chemistry Award. The STME was a great eye opener for Grace as she had the chance to listen to speeches from the first women to acquire STME degrees in Ghana, who were showcased over the period. With no Science 'Sixth Form'

in YAGSS, she proceeded to have her two-year Sixth Form education from 1990 at Saint Mary's Secondary School in Korlegono, Accra, after her Ordinary Level examination. Upon completion of her Sixth Form studies, she was posted to Saint Dominic's Senior High School in Pepease Kwahu, for a one-year National Service, where she taught Mathematics and Science. Enjoying the teaching, she decided to pursue a university degree as a requirement to teach in the Senior High School.

### **The University Education**

She thus enrolled in 1993 to pursue a Bachelor of Science Degree in Metallurgical Engineering (Mineral Processing and Extractive Metallurgy) in the then Institute of Mining and Minerals Engineering (IMME) of the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi. While studying for the bachelor's degree, Grace had Industrial Attachments at GRATIS Ltd, Tema, Ashanti Goldfields Company (AGC), Obuasi, and Ghanaian Australian Goldfields Ltd, Tarkwa, aside many field trips to mining and related companies, and these gave her a broader view of the industry. With her interest in becoming an academic one day, Grace declined an offer to have her second one-year National Service at the mining industry, and rather chose the then KNUST School of Mines, Tarkwa, now the University of Mines and Technology. During this period, she also had the chance to intern at Transworld Laboratory in Tarkwa.

As a Service Person, she had the opportunity to support the teaching of 'Principles of Metallurgical Engineering', an assignment she enjoyed so much. She thus decided to pursue a master's degree as a requirement to lecture in the university. She started her Master of Science Degree in Environmental Resources Management at the IMME, KNUST in October 1999, and was appointed a Demonstrator. She also had the opportunity for Internship at the Environmental Unit at the AGC Iduapriem Gold Mine, Tarkwa, while gathering data for her thesis.

### **The Working/Professional Life**

Upon graduation, Grace was appointed a Lecturer in October, 2002, exactly twenty years ago. Grace handled ten different courses within the initial



four years of lectureship, and also served as Lecturer-in-Charge of Mineral Dressing Laboratory, Departmental Examination Officer for Minerals Engineering and Faculty Examinations Officer for Mineral Resources Technology. She also served on various committees, and engaged in research and consultancy. After four years, Grace gained admission to start a four-year Doctor of Philosophy Degree in Energy and Mineral Engineering (EME) from August 2006 at the Pennsylvania State University, USA, under Ghana Government Scholarship. She undertook a pioneering research on “Mycohydrometallurgy-Simultaneous Biotransformation of Double Refractory Gold Ores using the Fungus, *Phanerochaete chrysosporium*”. This Dissertation was under the advisory of Prof Kwadwo Osseo-Asare and Prof Ming Tien, but two people whose names cannot be missed here for their ‘unofficial’ supervisory roles are Prof Yaw Yeboah, the then Head of EME Department and Prof Richard Kwasi Amankwah, the current Vice Chancellor of UMaT. While in Penn State, she served as a Teaching Assistant for a course on Aqueous Processing, and also as a Mentor for International Students. Grace was lucky to receive the Schlumberger Faculty for the Future Fellowship, and PEO International Peace Scholarship for Female Scientist from Developing Countries. She graduated in August 2010, resumed her position as a Lecturer in UMaT in September 2010, and applied for promotion to the rank of Senior Lecturer.

Within the next four years, Grace served in several capacities including, Departmental and Faculty Examinations Officer and University Examinations Coordinator, Head of Petroleum Engineering Department, and as a Chairperson/Member of several committees. She was appointed as a Visiting Assistant Professor at the African University of Science and Technology in 2012, and as a Part Time Senior Lecturer in the Materials Engineering Department of KNUST from 2013 and 2014. Grace was part of a Research Team that won Shell Ghana Award for a project on ‘Strength Augmentation of Grinding Discs Used in Small-Scale Gold Mining Operation’, International Growth Centre Award for a project on ‘The Informalisation of Ghana’s Small-scale Gold Mining Economy: Drivers and Policy Implications’, Development Partners in Higher Education (DePHE), UK, Award for research on ‘Artisanal Mining, Small-Holder Farming and

Economic Development’, and National Science Foundation, USA, Award for ‘Research and Education on Buruli Ulcer’. Grace received Australia-Africa Partnership Facility (AAPF) Award to participate in ‘African Women in Mining and Development Study Tour in South Africa and Australia’ in 2012.

Grace applied for Promotion to the Rank of Associate Professor in 2014, and the next four years saw her holding positions such as Head of Environmental and Safety and Head of Petroleum Engineering Departments and Vice Dean of Planning and Quality Assurance Unit. Her Headship of Petroleum Engineering Department for four years was designed for her to push the agenda of the then Vice Chancellor to transform the Department into the School of Petroleum Studies, that we see today. She served on such committees as UMaT Statutes Review, Disciplinary, Curriculum Review, International Conferences, and Independent PhD Scholarship Review. She also founded the Ladies in Mining and Allied Professions (LiMAP) in Ghana to bring like-minded females together to shine ahead and transform their generations. Grace also received several awards including the MEfDA Award to participate in the Maiden M4DLink Women in Resources Mentoring Programme, DAAD and HRK Fellowship to Participate in DIES Training on ‘Internal Quality Assurance in Anglophone West Africa’, Letter of Appreciation from UMaT Management on Effective and Efficient Leadership of Petroleum Engineering Department, and Best Female Lecturer of the Year 2014, an Award given by SRC, UMaT, Tarkwa, Ghana. One key achievement within this period for Grace was being one of the Five Women Recipients of the 2017 OWSD-Elsevier Foundation Award for Early Career Women Scientist in the Developing World for outstanding research in Engineering, Innovation and Technology and for serving as an inspiring role model to future generations of women science leaders. She was the Winner from Sub-Saharan Africa. Indeed, Prof Grace Ofori-Sarpong has been a pace setter and a role model to most females in this University and other areas within and outside Ghana. These females look up to her for inspiration in their professional development.

The following four years saw Grace rising high in the University and holding senior level positions. She was appointed as the Dean of the then Faculty of Mineral Resources Technology in 2018, and within the two years she pushed for the faculty to start one-year certificate programmes in all the departments within the faculty, and now, we see Certificate programmes in all Faculties in UMaT. In 2018 she was admitted as a Fellow into the Ghana Academy of Arts and Sciences (GAAS) after successfully going through the Academy's assessment; thanks to the nominator, Prof Francis K. A. Allotey. Since 2020, Grace has been the Dean of the School of Postgraduate Studies, where she has spearheaded several transformations including double admission, postgraduate diploma, professional doctorate, and the introduction of modules on Individual Studies and University Teaching Experience. Grace served as the Acting Pro Vice Chancellor from January to March, 2021, and performed her duties diligently. She has also served in other key positions locally, nationally and internationally over the past four years. These include UMaT 2022 Congregation Planning and Strategic Implementation Committees, Governing Councils of University of Mines and Technology, and Academic City College, Governing Boards of the Minerals Income Investment Fund and the Ghana Chamber of Mines Tertiary Education Fund, and the Ministerial Committee of Enquiry on Health and Safety in the Mining Industry. Other assignments include Organiser/Moderator/Resource Person of several Gender-related programmes and international conferences. Grace applied for promotion to the Rank of Full Professor in 2020.

In her two decades as an Academic, Prof Grace Ofori-Sarpong has taught over 20 courses at both the graduate and undergraduate levels and has supervised twelve PhDs, eleven Masters and seventy-eight Bachelors work. She has been active in research involving precious metal beneficiation, microwaves in extractive metallurgy, geometallurgical analysis, acid drainage potential studies, aqueous processing, water quality analysis, and microbial mineral interactions, among others. Her research has culminated into over 90 journal and conference publications, with 681 citations and H-index of 12 from Google Scholar, and many technical reports. Her pioneering work in mycohydrometallurgy made a great contribution

to the use of fungi in a 'one-pot' process to biotransform sulphides and carbonaceous matter simultaneously to enhance gold extraction from recalcitrant gold ores. She has about twenty publications in this research area, and the information disseminated has opened several research doors, evidenced by new publications that refer to her original work. It is clear that her research will continue to make impact in the scientific community in finding ways to smoothen out the engineering problems, which is required to move the process from bench-scale level through to commercialization. Prof Ofori-Sarpong is a reviewer for several scientific journals including Hydrometallurgy Journal, Minerals Engineering International, and Industrial and Engineering Chemistry Research.

### **Appreciation**

To God be the glory for the far He has brought me! Thanks to my family, teachers, supervisors, mentors, sponsors, partners, friends and All for their contributions to my career advancement.

## Abstract

In the processing of refractory gold ores (DRGO), many operational challenges are encountered, especially when the ore contains both organic carbonaceous matter (CM) and sulphidic minerals (SM). Different microorganisms have been employed in the pretreatment of the refractory materials, and various degrees of successes have been reported based on multiple-stage processes. About a decade ago, 'mycohydrometallurgy' was introduced into literature to define the application of fungi in hydrometallurgy, and this brought to the fore, the exploration of a 'one-pot' transformation of CM and SM, with the aim of enhancing subsequent cyanidation gold recovery.

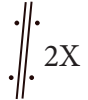
The fungus *Phanerochaete chrysosporium*, was consequently used to biotransform surrogate CM on one hand to reduce its gold adsorption (preg-robbing) capability, and decompose SM (pyrite and arsenopyrite) on the other hand to liberate locked-up gold for dissolution. Flotation concentrate (FC) of DRGO, containing 14.9% sulphide sulphur and 3.6% organic carbon, was used to validate the 'one-pot' process by being incubated with *P. chrysosporium* under in-vivo treatment for up to 21 days. The overall sulphide sulphur oxidation was 57%, while preg-robbing index decreased by 64%, and together, these translated into an increase in gold recovery from 41% to 78%. The findings of this research thus professes a novel alternative pretreatment process for DRGO. Current research is exploring the use of in-vitro transformation using cell-free components of *Phanerochaete chrysosporium*.

**Keywords:** *Phanerochaete chrysosporium*; Double refractory gold ores; One-pot process; In-vivo biotransformation; Cyanidation gold recovery.

## University Anthem

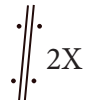
1. God bless the University of Mines and Technology  
The institution anointed with great mission  
To fly above the limits of the sky  
To provide higher education  
To provide higher education  
Through teaching, through research and through service

*Our motto is knowledge, truth and excellence,  
Our motto is knowledge, truth and excellence,  
UMaT, arise and shine, arise and shine, arise and shine  
Yes! UMaT arise and shine*



2. Praise God for University of Mines and Technology  
The institution anointed with great vision  
To become a center of excellence  
For the training of world class professionals  
And provide Africa's urgent needs  
Through teaching, through research and through service

*Our motto is knowledge, truth and excellence,  
Our motto is knowledge, truth and excellence,  
UMaT, arise and shine, arise and shine, arise and shine  
Yes! UMaT arise and shine*



**Words by: Prof. D. Mireku-Gyimah**

**Music by: Sir M. K. Amissah**

## University Song (Adopted)

1. Now praise we great and famous men,  
The fathers, named in story;  
And praise the Lord who now as then  
Reveals in man His glory
2. Praise we the wise the brave and strong  
Who graced their generation;  
Who helped the right, and fought the wrong,  
And made our folk a nation
3. Praise we the peaceful men of skill  
Who builded homes of beauty,  
And rich in art, made richer still  
The brotherhood of duty
4. So praise we great and famous men  
The fathers named in story;  
And praise the Lord who now as then  
Reveals in man His glory

**William George Tarrant**  
(1853-1928)

